

ENGINEERING, ECONOMICS, STRUCTURES & INNOVATIONS

**Mark Arena
Section Editor and Moderator**

Twenty-eight students competed in the Bryson L. James Student Research Competition and twenty-nine research projects were presented in poster form, which were displayed for review during the SNA Research Conference and Trade Show, this year. Their research is presented in the topical sections which follow and are designated as Student or Poster papers.

Using Industry Data to Evaluate the Grower-Wholesaler's Financial Performance

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Nature of Work: The manager of a business is the decision maker who determines the financial success of the business venture. Upon his/her shoulders fall the responsibilities of the day-to-day activities, anticipating the future obligations and opportunities, and interpreting the appropriateness of past actions. Even though events that occurred in the past usually do not represent income or loss directly for future periods, the manager ordinarily profits from careful analysis of the historical data to serve as a basis for future decisions. Common to all businesses is the following definition of the basic economic purpose of sound management: "planned deployment of selected resources in order to create, over time, economic value sufficient to recover all the resources employed while earning an acceptable return on these resources under conditions that match the owners' expectations of risk."

No matter how closely an owner or manager of a green industry business scrutinizes one's own formal financial statements (the income statement, the reconciliation of net worth, the balance sheet, and the cash flow statement), a grower-wholesaler needs industry data, at the least, to make comparisons to see how well, or how poorly, a business is truly performing. In spite of the possibility of most indications being positive in analyzing a set of financial statements, a grower-wholesaler may be out-performed by the other participants in the industry. That is not to infer that net sales or net income is the measuring stick for financial performance, as each business has its own goals, capacity, target market, and production-marketing mix, which will garner various sales levels from the resources or assets of the grower-wholesaler.

Results and Discussion: Common-size analysis encourages the manager to evaluate the business against the average of other similarly sized companies (by either net sales or total asset values) in the same business activity, as specified by the SIC code (Standard Industrialization Classification). [For instance, the code for grower-wholesalers of flowers, nursery stock and florists' supplies is SIC 5193.] Common-size analysis requires external data and information on the other businesses, so that the manager can evaluate and compare the business in question against some norm or "standard." External sources of financial information include Robert Morris Associates (RMA), the Almanac of Business Financial Ratios, Standard and Poors (S&P), Dunn and Bradstreet,

among others—all available in many libraries or on the Internet or regional business outreach service centers. Selected data sorted by sales ranges are presented in Table 1 for grower-wholesalers, as developed from Robert Morris Associates' Annual Statement Studies, 1996.

Common-size analysis presents a summary of the vertical analysis, both by net sales and total assets, as well as financial ratio analysis. Financial ratios are merely symptoms of the financial health of a business, as of a moment in time ala a snapshot. There is no one ratio that portrays the financial health of a business in its entirety. Nor is there one universal criteria (set of ratios) nor one finite set of ratio values that all businesses, regardless of industry or size of business, are compared against. The variability of ratios within a sales or asset value range is reflected in common size analysis via calculated quartile ratio values. The three quartile values presented for each ratio (Table 1) reflect (a) an upper quartile number that 25% of the calculations for the ratio exceeded; (b) the median score or value representing the ratio value that 50% of the businesses either exceeded or were below; and (c) a lower quartile score that 75% of the businesses exceeded while 25% had a calculated ratio below the reported value.

The implication of what a ratio suggests and an understanding of how to improve the ratio (may not necessarily be an increase, as for some ratios a smaller value is preferred) is more important than the ratio value itself. Financial ratios are used by observers outside the business, especially by creditors, loan officers, potential investors, future owners, and the government, as well as the manager within the firm. Ratios allow these individuals a speedy, concise manner to evaluate the firm's financial health. The financial ratios should give a historical perspective of the business and review the management skills (of the grower-wholesaler) that have guided and operated the business to date.

Vertical analysis allows a manager to evaluate a firm's financial statements, specifically the income statement and the balance sheet. Vertical analysis is the calculation of the statement's components as a percentage of the whole—net sales for the income statement and total assets for the balance sheet. For the income statement, each of the accounting entries or component values is calculated as a percent of net sales, such that each dollar value cited on the income statement is divided by net sales, including each of the specific operating expenses (not just aggregate or a category of expenses). Vertical analysis of the income statement allows the manager to evaluate the cost structure and individual expenses relative to the value of net sales (revenue) regardless of the dollar values or how much sales, or any other value, may have changed.

Deviations, trends, consistencies and other observations can be readily evaluated, especially year-to-year and comparing with other similar common-size businesses.

Vertical analysis can also be performed for the balance sheet. Recall that the sum of the assets must equal (balance) the sum of the liabilities plus the owners' equity or net worth for a balance sheet to be correct. Therefore, the values of each component or category is divided by the value of total assets. Rather than evaluating the business on its financial performance using the income statement, vertical analysis of the balance sheet focuses on the firm's financial position, regardless of how the business may have grown in asset values or net worth.

Significance to Industry: Growers and marketers live and operate in a world of uncertainty. Rarely is known the exact what, when, where, how, and how much of any decision and its possible outcomes. Decisions must still be made, and with certainty the financial status of the grower-wholesaler will be affected. Knowing how to analyze a firm's financial health and developing strategies to maintain and/or improve its economic health is crucial to the business's success and survivability. The use of external data sources aids in the financial and managerial evaluations. Minor mistakes equal major money in financial management.

Literature Cited:

1. Robert Morris Associates. 1996. Annual Statement Studies.
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3. Costales, S.B. and Geza Szurovy. 1994. The Guide to understanding Financial Statements. Second Edition. McGraw Hill, Inc.

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Table 1. Selected Financial Data Sorted by Sales for Wholesalers of Flowers, Nursery Stock, and Florists' Supplies (SIC 5193), 1996.

Common-Size Sales Values	0-\$1 million	\$1-3 million	\$3-5 million	\$5-10 million
Assets:				
Cash & Equivalents	11.5%	11.7%	4.9%	6.0%
Trade Receivables (net)	12.0	22.4	30.4	23.8
Inventory	20.0	25.9	33.9	30.9
All Other Current Assets	3.2	2.3	1.1	1.7
Total Current Assets	46.7	62.4	70.2	62.4
Fixed Assets (net)	47.6	30.5	23.7	31.5
Intangibles (net)	1.5	.3	1.5	.4
All Other Non-Current	4.2	6.8	4.6	5.7
Total Assets	100.0	100.0	100.0	100.0
Liabilities:				
Notes Payable (S-T)	21.9%	13.8%	20.7%	17.5%
Trade Payables	11.6	12.4	18.8	18.4
All Other Current Liab.	7.8	7.4	4.9	5.2
Total Current Liabilities	41.2	33.8	44.3	41.1
Long Term Debt	23.9	18.1	10.5	17.6
All Other Non-Current	9.2	4.6	4.8	3.5
Net Worth/Owners' Equity	25.7	43.6	40.3	37.8
Total Liabilities + Net Worth	100.0	100.0	100.0	100.0
Income Data:				
Net Sales	100.0%	100.0	100.0	100.0
Gross Profit	46.9	36.1	34.4	37.1
Operating Expenses	40.3	33.5	32.7	32.7
Operating Profit	6.6	2.7	1.7	4.4
All Other Expenses (net)	2.0	.8	.9	.9
Profit Before Taxes	4.8	1.9	.8	3.5
Ratios:				
Current Ratio	3.1; 1.3; .6	2.8; 1.9; 1.4	2.3; 1.9; 1.2	2.1; 1.4; 1.2
Quick (Acid Test) Ratio	1.4; .7; .2	1.7; 1.1; .6	1.2; .7; .5	1.0; .7; .5
Avg. Days Receivables	0; 11; 38	12; 29; 45	27; 36; 58	23; 33; 51
Avg. Days Inventory	0; 33; 83	9; 32; 126	48; 73; 122	31; 54; 126
Avg. Days Payables	0; 14; 35	0; 19; 48	18; 36; 56	18; 35; 62
Sales/Working Capital	3.8; 21.5; -13.6	3.9; 10.7; 26.2	6.8; 12.1; 20.2	6.6; 12.1; 31.2
Debt/Net Worth	.6; 2.2; -15.7	.6; 1.2; 2.8	.7; 1.6; 2.9	1.0; 2.2; 3.7
Sales/Net Fixed Assets	17.3; 6.2; 2.1	33.7; 11.1; 5.2	39.7; 16.1; 4.6	28.2; 12.6; 3.8
Sales/Total Assets	4.1; 2.3; 1.5	4.4; 2.6; 1.5	3.5; 2.5; 1.8	3.7; 2.6; 1.8

Structural Change in the Nursery Industry: Mergers and Acquisitions Versus Internal Growth

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Nature of Work: The nursery industry at the grower level in the United States is competitive with relatively low market shares (unconcentrated) for the leading businesses. Few nurseries are publicly traded stock ownership companies, and most are just a generation or two from their original founders. Questions about mergers and acquisitions usually do not arise until a company has attained recognition for sales, net worth, market value, market share or some combination of various financial measurements. The purpose of this research is to review some important factors that are considered when a firm is considering a merger or acquisition. An ancillary objective is to consider the characteristics of landscape plants producers that might be potential candidates for public offerings.

A firm may achieve its financial goals through direct or indirect investment and by internal or external expansion. Direct investment implies the new acquisition of income producing assets (resources), while indirect investing refers to acquiring existing income producing assets by gaining control of the title holding firm [Clark]. With respect to expansion, the means of financing is the primary consideration whereby internal growth relies primarily on retained earnings although the use of debt or equity issues is not precluded. External growth refers to expansion through business combinations, which can be financed by cash and/or an exchange of securities or equity positions [Clark].

The reasons behind mergers reflect economic, financial, and personal factors. Primary economic factors are economies of scale and economies in operations. Economies of scale occur when average cost declines with increases in volume. These can occur in production, marketing, distribution, accounting and finance, among other functions. Operating economies can be achieved through efficiency by elimination or consolidation of duplicate facilities, personnel, etc. [Van Horne]. Growth might also cost less through acquisition than via internal investment. This is heavily dependent on the purchase or exchange price of the acquisition or merger.

Most economic analysts would argue that economic factors are a primary motivation behind most mergers and acquisitions. The five financial values have received the greatest emphasis in arriving at merger terms

are earnings and the growth rate of earnings, dividends, market values, book values, and net current assets [Van Horne]. The key aspect with respect to growth through mergers or acquisitions is speed. But risk increases along with growth and the risk involved with acquisitions can be greater than that generated by internal growth. Another consideration is the management acquired through the merger. Competent and aggressive management may be a major reason to consider merger opportunities.

Besides buying market share, another quick way to buy growth is diversification. The key requisite in a diversification motive is spreading risk. The risk might be related to production, marketing, distribution, financing, or management. Particularly important in the nursery industry is production and distribution risk. As firms grow, they usually try to spread production risk by having production units in different locations or plant hardiness/climatic zones. Again, acquisition is usually the quickest way to obtain production units on a large scale.

Data: To get a snapshot of the financial structure of the ornamentals nursery and floriculture products sector, annual sales data for 398 firms were collected for the 1997 marketing year. For comparison purposes, data for the top 41 firms was collected for the ornamental floriculture and nursery products industry and for the poultry industry, another prominent Southern agricultural industry. The nursery sector data was obtained from Dunn & Bradstreet Business Rankings—1997, and the poultry data were obtained from Poultry magazine.

Results and Discussion: When the top 398 firms (each representing more than \$2 million in annual grower receipts) in the ornamental floriculture and nursery products sector are examined, the top firm has 6.3% market share, followed by the next four firms having 4.9%, 4.8%, 3.8%, and 2.9% market shares, respectively, of the aggregate sales for these 398 firms. These five firms accounted for about 22% market share; the top 25 firms accounted for 41.66% market share; the top 50 firms accounted for 51.27% market share; and the top 100 firms account for 64.29% market share. These numbers overstate the actual market share, for if \$11.4 billion grower receipts for 1997 are used [Johnson], the market share numbers change dramatically. For instance, the top firm's market share drops from 6.3% to 1.54%, with the next four firms having market shares of 1.20%, 1.19%, 0.93%, and 0.73%, respectively, for a top five market share of 5.61% of the \$11.4 billion market. Similarly, the top 25 firms, 50 firms, and 100 firms account for 10.22%, 12.58%, and 15.78% market share, with the 398 firms included in the sample accounting for a combined 24.54% market share.

Currently, two ornamental floriculture and nursery products sector firms are publicly traded. Hines Horticulture (HORT) and Imperial Nurseries (GRIF) are traded on the NASDAQ. Color Spot Nurseries was scheduled for an initial public offering on NASDAQ, but it was canceled. Hines' initial public offering on June 23, 1998 at \$11 per share saw trading between $10\frac{1}{2}$ and $11\frac{3}{8}$. Since that time, Hines has traded mostly above 11, and is being recommended by several brokerage firms as a buy stock. In comparison, six of the top 41 largest poultry firms are publicly traded companies.

The poultry industry and the ornamental floriculture and nursery products industry were compared by examining the largest 41 firms in each industry. The actual numbers with respect to relative market share are appropriate for comparison purposes only. The top firm in the poultry industry is much more dominant (23% market share versus 14% for the leading nursery). The four firm concentration is 48% for poultry versus 41% for the ornamental floriculture and nursery products, using the 398 firm nursery data.

Significance to the Industry: The ornamental floriculture and nursery products sector is much less concentrated than some other Southern agricultural sectors, such as the poultry industry. Only two nursery firms are publicly traded. There appear to be opportunities for mergers and acquisitions in the ornamental floriculture and nursery products sector. It is apparent that most firms have decided that it is to their advantage to grow internally rather than through mergers and acquisitions. An examination of sales levels for 398 ornamental floriculture and nursery products firms reveals that four firms had 1997 sales exceeding \$100 million each, five firms had sales more than \$50 million each, 16 firms surpassed \$25 million each, 45 firms had sales more than \$10 million each, and 144 firms had individual sales above the \$5 million threshold.

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Economic Analysis of Producing Selected Plant Species Using Containers Treated with Spinout®

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Nature of Work: The purpose of this economic analysis was to determine if any of the production-related costs were altered due to the use of $\text{Cu}(\text{OH})_2$ -treated containers relative to non-treated containers during production. Two hundred eighty-eight seedlings of *Fraxinus velutina* Torr. (Arizona ash), *Quercus virginiana* Mill. (live oak), and *Rapheolepis indica* Lindl. (Indian hawthorn) and two-hundred forty seedlings of *Myrica cerifera* L. (waxmyrtle) were grown in College Station, Texas in 0.24 L containers half treated with $\text{Cu}(\text{OH})_2$ and half with no-treatment. All plant species were transplanted into sequential combinations of treated and non-treated 2.7 L then 10.4 L or 12.7 L containers resulting in a 2 x 2 x 2 factorial combination in a randomized complete block design.

It was hypothesized a priori that potential economic impacts could be realized in the areas of transplant labor, growth rate, and plant quality. If an increase in the growth rate were to occur due to the use of a particular treatment combination, a reduction in total cost would be realized due to a shorter production cycle and lower plant maintenance costs (watering, increased usage of space by quicker turnover of plants, trimming of plants, fertilizing). Another possible benefit is a superior quality plant that could be sold for a higher price if plants were shown to adapt quicker with a greater quality growth and increased longevity due to a particular treatment combination, and consumers were aware of and demanded such plant superiority.

Results and Discussion: At transplant from 2.7 L containers, there was a significant time (labor) savings for all species. A savings in time (labor) may be due to transplanting efficiencies (reduced effort) associated with reduced root growth at the container wall:media interface in copper-treated containers. Even with this savings in labor factored into the cost of production for all plant species across all container stages, plants that were grown with any Spin Out® treatment had a higher cost of production than plants grown only in non-treated containers. This higher cost was primarily due to the materials cost for using the $\text{Cu}(\text{OH})_2$ -treatment, with a lower cost between the two treatment options (pre- or self-treated) for pre-treated containers.

Effects on the growth rate of Arizona ash and live oak, as expressed by the length of the production cycle (which was measured by when the plants were available for transplant), showed no difference between the control and other treatment combinations while being grown in 12.7 L containers prior to overwintering in the Fall of 1995. Southern waxmyrtles at the 2.7 L container stage in Fall 1995 had a lower number of marketable plants with $\text{Cu}(\text{OH})_2$ -treatment at the liner and 2.7 L container stages. However, Indian hawthorn plants with the same treatment combination and time at the 2.7 L container stage had a greater number of available $\text{Cu}(\text{OH})_2$ -treated plants for sale than the control.

Specific treatment combinations resulting in an increased or decreased number of marketable plants relative to the control were inconsistent across species, making it impossible to recommend any one treatment combination across plant species. Treatment at earlier phases of production did not elicit consistent responses in combination with similar treatments during later phases of production. Likewise, responses to various container treatment combinations were seldom consistent across species. When determining a treatment effect on marketability, it was found that any significant effects were evidenced after the plants had been grown in their final container sizes through their first winter.

This study shows that the economic savings to the nursery grower in terms of reduced labor at transplanting or faster growth that might be realized by the use of Spin Out® in the production process were not statistically significant, nor were the results consistent for these four plant species. There were some benefits (as with Indian hawthorn) at the final container stage for the number of marketable plants. Substantial economic and non-economic benefits do exist, however, for retail or landscape consumers stemming from the use of Spin Out® during the production phase.

Long-term benefits of reduced worker fatigue associated with easier removal of rootballs from Spin Out®-treated containers would not be exhibited in this study since data represented a small number of containers transplanted at any particular date. When factored over thousands of man-hours of transplanting thousands of plants, this reduction in worker fatigue may be manifested as substantial labor savings and/or reduced injury rates. Easier removal of plants from larger container sizes may reduce the incidence of shoulder or back injuries, but would only be manifested over extended time frames and greater number of production units.

When considering the cost of producing plants in copper-treated containers, this experiment did not include the possible marketing benefits associated with an increased demand by consumers (landscapers or homeowners) who find added value in the root-pruning benefits. Some landscape professionals consider it standard practice to root-prune many species of plants for root control before planting into the landscape. There have been documented benefits of post-transplant success with copper treatments which exceed that of root-pruning or no pruning.

The complexity of looking at variations in costs of production in an entire enterprise approach was simplified by using a partial budgeting approach. The differential costs in this experiment only included those that may incrementally vary due to treatment with Spin Out®. There was no significant variation in the production cycle so that a reduction in costs due to early marketability was not realized.

Significance to Industry: No economic research has been published comparing copper and non- copper treatment benefits of Spin Out®. It is possible that the use of copper treatments may provide more uniform plant growth because root loss is not as severe during transplant stages. If the potential benefits are realized, the reduced time lag during transplanting at the rapid growth phase (the highest cost period) may mean a higher valued product since the number of days from transplanting to the start of growth of a plant may mean the difference between a salable plant and one that remains in the nursery another season.

The largest benefit will likely be realized by consumers in the form of improved initial plant growth after transplant into the landscape. However, potential benefits to the nurseryman are possible. These potential benefits may include more efficient use of labor during transplanting. Transplanting time might be reduced without the need for root pruning in addition to easier removal of non-root bound plants from containers and possibly reduce fatigue to workers during transplanting. Increased plant growth after transplanting to a larger container might mean quicker marketability. Decreased production times may result in more crop rotations in the nursery and an annual increase in total number of plants produced per given nursery area.

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**Internships - Reflections of the
Environmental Horticulture Industries**
(Poster)

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Florida

Nature of Work: In 1975 the Environmental Horticulture Department initiated a work experience program. Students who will work full time for an environmental horticulture firm may register for ORH 4941 Practical Work Experience. Although the course is not required, 241 students have participated in the program since its inception. However, only two evaluations of students and employing firms participating in the work experience program have been conducted during the past 23 years, one in 1977 (2) and one in 1994 (1). Each of those studies evaluated student and employing firm characteristics for a single year of the work experience program.

The objectives of this study were twofold: (1) To examine selected characteristics of students and employing firms participating in the work experience program for five consecutive years and, (2) To determine if trends were evident in student selection of firms for their practical work experience.

Results and Discussion: When the distribution of 75 internships from 1994 through 1998 were compared to the distribution of 17 internships in 1994 (1), both similarities and differences were detected. Golf courses, landscape maintenance at major theme parks, and greenhouse/ nursery production continued to be the top three student choices (Table 1). However, the percentage of students interning at botanical gardens exhibited an increase from 6% of the internships in 1994 to 9% of all internships during the five year period. A new category, ecotourism which accounted for 4% of the internships, was added to the internship classification. The increased student interest in botanical gardens and ecotourism reflects changes in societal attitudes towards environmental preservation and protection of endangered species. A major decline in students interning in firms specializing in landscape installation occurred during the five year period. The percentage of students interning in retail garden centers, and product representation, research, and sales for large national agribusiness corporations were similar to figures reported for 1994. The category attracting the least student attention was interiorscapes and accounted for only 1% of the internships.

Most students participate in the work experience program after completing their Junior year course requirements. This is evident when the number of graduating seniors are compared to the number of students participating in the work experience program (Figure 1). It reveals a one year lag period between the peaks and valleys of students interning and students graduating. When demographics of students participating in the program were compared to departmental students (Table 2), small but subtle differences were evident. The grade point average (GPA) was slightly higher for students participating in the program than the general student population and the percentage of female students participating in the work experience program was slightly lower than their percentage of graduating seniors.

Significance to Industry: The trends evident in the commodity areas that students have selected via interning reflect their interests and their perception of where employment and advancement opportunities will exist in the Environmental Horticulture Industry after they graduate. Only 17% of 75 students interned in greenhouse/nursery production facilities. This suggests that a majority of students may perceive wholesale plant production as a career offering limited employment and advancement opportunities, or less career satisfaction, or lower societal status than other career options for students graduating with a baccalaureate degree in Environmental Horticulture.

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Table 1. Classification of and Number of Student Internship from 1994 - 98.

Commodity/ Activities Group	Year					Total	Per cent
	1994	1995	1996	1997	1998		
Golf Courses/ Sports Turf	5	3	3	7	8	26	35
Landscape Maintenance Theme Parks	4	3	1	3	4	15	20
Greenhouse and Nursery Production	3	5	2	1	2	13	17
Botanical Gardens	1	2	1	1	2	7	9
Landscape Installation	2	1	1	0	0	4	5
Retail Garden Center	1	1	0	0	1	3	4
Eco-Tourism	0	0	0	3	0	3	4
Agri-Business Corporation Product Representation/ Research/ Sales	1	0	1	0	1	3	4
Interiorscapes	0	1	0	0	0	1	1

Figure 1. Number of Students Participating in the Environmental Horticulture Internship Program and Number of Graduating Seniors.

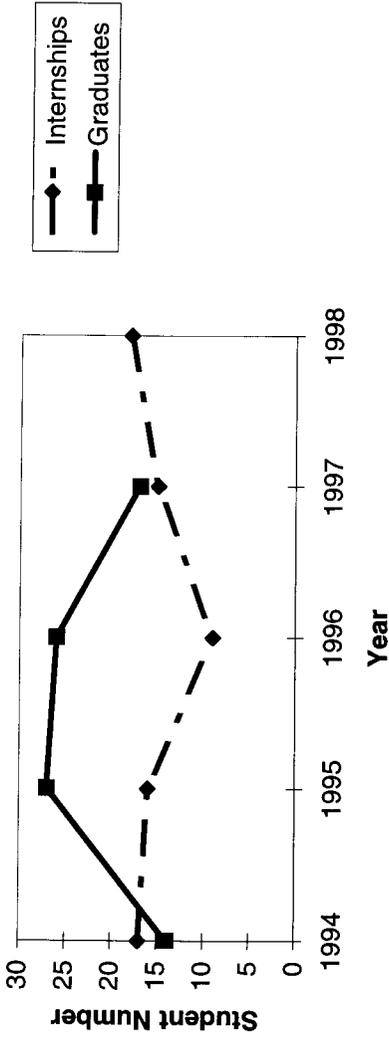


Table 2. Selected Student Characteristics - 1994 - 98.

Students	Number	GPA	Per Cent Female
Internship	75	2.95	22
Departmental	62*	2.80*	29**

*Five year average of students registered spring semester; **average of graduating seniors.